Probing Parity Violation with Spin-Precessing Binaries

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Abstract. The gravitational interaction between compact objects in a binary system couples the spin and orbital angular momenta, inducing spin-precession in the system. Precession of the orbital angular momentum induces an amplitude modulation in the observed gravitational wave signal of the binary. Not only does this modulation provide important information about the spins of the compact objects, it also contains information about the fundamental nature of the gravitational interaction. We will here construct the gravitational wave signature from spin-precessing binaries in dynamical Chern-Simons gravity, a parity violating theory where spinning black holes are modified from general relativity. Further, we will discuss how these results can be generalized to other modified theories and tests of general relativity.